UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/670,975	09/27/2000	Charles E. May	00-140	6488

24319 7590 01/12/2004

LSI LOGIC CORPORATION
1621 BARBER LANE
MS: D-106 LEGAL
MILPITAS, CA 95035

EXAMINER	
KIELIN, ERIK J	

ART UNIT	PAPER NUMBER
2813	

DATE MAILED: 01/12/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/670,975	MAY ET AL.	
	Examiner	Art Unit	
	Erik Kielin	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 October 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5 and 7-20* is/are pending in the application.

4a) Of the above claim(s) *9-20* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,7 and 8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

This action responds to the Amendment filed 30 October 2003.

Claim Objections

1. Claims 7 and 8 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

Claims 7 and 8 do not further limit independent claim 1 because the order of use of temperature changing processes is not required. Accordingly, claims 7 and 8 broaden rather than narrow independent claim 1.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-5, 7 and 8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As presently written, it is unclear in claim 1 if the process energy is ever changed as a result of a failure of "both the thermal transfer media temperature and the thermal transfer media flow rate" to change the chuck temperature to the desired level, because the claim does not require such failure to occur. Additionally, because the claim recites "**when** changing both the

thermal transfer media temperature and the thermal transfer media flow rate," there is no required for both thermal transfer media temperature and flow rate to be changed.

As reasonably interpreted, then, claim 1 recites a Markush group of options, wherein in one option the process energy never has to be changed so long as the desired chuck temperature is reached. Another option is that only one of --rather than both of-- the thermal transfer media temperature and the thermal transfer media flow rate need to be changed so long as the desired chuck temperature is reached, because claim 1 recites, "by first adjusting **at least one of** the thermal transfer media temperature and the thermal transfer media flow rate."

For the purposes of patentability, the claims will be interpreted to have the Markush group options. The remaining claims are rejected for depending from the above rejected claim.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-5, 7, and 8 rejected under 35 U.S.C. 102(b) as being anticipated by US 5,591,269 (**Arami** et al.).

Regarding claims 1-3, **Arami** discloses a method for controlling a substrate temperature (col. 2, lines 44-47) of a substrate **W** (Fig. 18) during processing of the substrate at a process energy **130**, **131**, **132**, by controlling a chuck temperature of a chuck (Abstract) on which the substrate resides during the processing, comprising:

circulating a thermal transfer media **115**, **151** at a thermal transfer media temperature through the substrate chuck to adjust both the chuck temperature and the substrate temperature, the thermal transfer media circulating at a flow rate (Fig. 18; col. 16, lines 29-48);

sensing the chuck temperature from three chuck temperature sensing locations **152**, **153**, **154** within the chuck -- as further limited by instant claims 2 and 3 (Fig. 18);

reporting the sensed chuck temperature to a controller **119**, where the controller is operable to adjust the process energy **130**, **131**, **132** and at least one of the thermal transfer media flow rate and the thermal transfer media temperature (col. 9, lines 11-24); and

when the sensed chuck temperature is outside of a desired temperature range, then using the controller to first adjust at least one of the thermal transfer media flow rate, the thermal transfer media temperature, and the process energy to bring the sensed chuck temperature within the desired temperature range (col. 9, lines 11-24). Because the chuck reaches the desired temperature, the process energy does not have to be changed.

Regarding claim 4, the temperature sensor **155** is disposed "on **a** surface" of the chuck (Fig. 21). In order for the sensor to in the chuck, the sensor must be in contact with "a" surface of the chuck. Therefore the literal meaning of the limitation is met.

Regarding claim 5, the method of claim 1 wherein the desired temperature range is between about fifty centigrade and about five hundred centigrade (col. 18, lines 3-12).

Regarding claim 7, the controller is used to adjust at least one of the thermal transfer media flow rate, the thermal transfer media temperature, and the process energy to cool the chuck and the substrate and thereby to bring the sensed temperature within the desired temperature range (col. 9, lines 11-24).

Regarding claim 8, the controller is used to adjust at least one of the thermal transfer media flow rate, the thermal transfer media temperature, and the process energy to heat the chuck and the substrate and thereby to bring the sensed temperature within the desired temperature range (col. 9, lines 11-24).

6. Claims 1, 3, 4, 7, and 8 rejected under 35 U.S.C. 102(b) as being anticipated by US 5,435,379 (**Moslehi** et al.).

Regarding claims 1 and 3, **Moslehi** discloses a method for controlling a substrate temperature (Abstract) of a substrate **19** (Fig. 3) during processing of the substrate at a process energy (col. 3, 14-27) by controlling a chuck temperature of a chuck (Abstract) on which the substrate **19** resides during the processing, comprising:

circulating a thermal transfer media **22** at a thermal transfer media temperature through the substrate chuck **18** to adjust both the chuck temperature and the substrate temperature, the thermal transfer media circulating at a flow rate (Fig. 3; col. 3, line 42 to col. 4, line 7);

sensing the chuck temperature from at least one chuck temperature sensor **48** within the chuck **18** -- as further limited by instant claims 3 (Fig. 3);

reporting the sensed chuck temperature to a controller **50**, where the controller is operable to adjust at least one of the thermal transfer media flow rate and the thermal transfer media temperature (Fig. 4; col. 3, line 42 to col. 4, line 7; col. 4, lines 39-56); and

when the sensed chuck temperature is outside of a desired temperature range, then using the controller to first adjust at least one of the thermal transfer media flow rate, the thermal transfer media temperature, to bring the sensed chuck temperature within the desired temperature

range (col. 3, line 42 to col. 4, line 7; col. 4, lines 39-56). Because the chuck reaches the desired temperature, the process energy does not have to be changed.

Regarding claim 4, the temperature sensor **48** is disposed "on **a** surface" of the chuck (Fig. 21). In order for the sensor to in the chuck, the sensor must be in contact with or on "a" surface of the chuck. Therefore the literal meaning of the limitation is met.

Regarding claim 7, the controller is used to adjust at least one of the thermal transfer media flow rate, the thermal transfer media temperature, and the process energy to cool the chuck and the substrate and thereby to bring the sensed temperature within the desired temperature range (Abstract; col. 3, line 42 to col. 4, line 7; col. 4, lines 39-56).

Regarding claim 8, the controller is used to adjust at least one of the thermal transfer media flow rate, the thermal transfer media temperature, and the process energy to heat the chuck and the substrate and thereby to bring the sensed temperature within the desired temperature range (col. 9, lines 43-54).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1-3, 5, 7, and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,605,600 (**Muller** et al.) in view of **Arami**.

Regarding claims 1-3, **Muller** discloses a method for controlling a substrate temperature (col. 1, lines 43-55) of a substrate **104** (Fig. 4) during processing of the substrate at a process energy ("RF power" for etching; col. 2, lines 7-26), by controlling a chuck temperature of a chuck **105** on which the substrate resides during the processing, comprising:

circulating a thermal transfer media at a thermal transfer media temperature through the substrate chuck to adjust both the chuck temperature and the substrate temperature, the thermal transfer media circulating at a flow rate (col. 1, line 56 to col. 2, line 6; col. 2, lines 27-41);

sensing the wafer temperature from at least one wafer temperature sensing location at the chuck, (Fig. 3);

reporting the sensed chuck temperature to a controller, where the controller is operable to adjust the process energy and at least one of the thermal transfer media flow rate and the thermal transfer media temperature (col. 5, lines 54-59; col. 7, lines 47-54); and

when the sensed chuck temperature is outside of a desired temperature range, then using the controller to adjust at least one of the thermal transfer media flow rate, the thermal transfer media temperature, and the process energy to bring the sensed chuck temperature within the desired temperature range (col. 5, lines 54-59; paragraph bridging cols. 5-6; col. 7, lines 47-54). Because the chuck reaches the desired temperature, the process energy does not have to be changed.

While **Muller** is silent to means of sensing the temperature of the wafer, **Arami**, as noted above, discloses an electrostatic chuck for controlling the temperature of a semiconductor wafer and teaches the benefits of measuring the wafer temperature using three locations from within

the chuck in order to get better uniformity and control of the wafer temperature (Arami, col. 2, lines 44-47).

It would have been obvious for one of ordinary skill in the art, at the time of the invention to measure the temperature of the chuck from three locations within the chuck in the method of **Muller**, in order to obtain more thorough information of the wafer temperature for better control of the process, as taught by **Arami**.

Regarding claim 5, **Muller** discloses that an exemplary desired temperature range is 145 °C (col. 3, lines 48-52), which is between about 50 °C and about 500 °C.

Regarding claim 7, **Muller** discloses the controller is used to adjust at least one of the thermal transfer media flow rate, the thermal transfer media temperature, and the process energy to cool the chuck and the substrate and thereby to bring the sensed temperature within the desired temperature range (col. 6, lines 14-26; col. 6, lines 54-65).

Regarding claim 8, **Muller** discloses the controller is used to adjust at least one of the thermal transfer media flow rate, the thermal transfer media temperature, and the process energy to heat the chuck and the substrate and thereby to bring the sensed temperature within the desired temperature range (col. 6, lines 14-26; col. 6, lines 54-65).

Response to Arguments

The rejection over the Gifford reference was removed due to the amendment to independent claim 1 requiring that the sensor be "in" the wafer chuck. All other features are taught. While Examiner acknowledges Applicant's argument that Gifford does not teach sensing the temperature of the chuck, this is in error. Gifford expressly states that the temperature of the

chuck (called "wafer electrode 36" in Gifford) may be measured with the IR camera at col. 7, lines 40-47, as expressly noted by Examiner in the previous Office action filed 6 August 2003.

Applicant argues that the applied art of Arami and Muller in view of Arami do not teach the instant claims. The basis of Applicant's arguments is on a selective interpretation of the presently amended claim 1. As indicated above in the rejection of claim 1 under 35 USC 112(2), claim 1 does not require all of the steps to be performed. Accordingly, since the chuck reaches the desired temperature, the process energy does not have to be changed and the literal claim limitation of claim 1 is met. The claims as presently written are unenforceable.

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Erik Kielin whose telephone number is 703-306-5980. On or about 5 February 2004, this number will change to 571-272-1693. The examiner can normally be reached on 9:00 - 19:30 on Monday through Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached at 703-308-4940 (new telephone number will be 571-272-1702). The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9318 for regular communications and 703-872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Erik Kielin
Primary Examiner
January 8, 2004